

UNIVERSITI TEKNOLOGI MARA

**ISOLATION AND
CHARACTERIZATION OF
ANTIMICROBIAL PEPTIDES FROM
OKARA WASTE**

NURUL IZZATY BINTI SIDDIK

Thesis submitted in fulfillment
of the requirements for the degree of
Bachelor of Engineering (Hons.)
Chemical and Bioprocess

Faculty of Chemical Engineering

July 2018

ACKNOWLEDGEMENT

Firstly, I wish to thank God for giving me the opportunity to embark on my Bachelor Degree and for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisor Dr. Tan Huey Ling.

Special thanks to my colleagues and friends for helping me with this project.

Finally, this thesis is dedicated to the loving memory of my very dear father and mother for the vision and determination to educate me. This piece of victory is dedicated to both of you. Alhamdulillah.

ABSTRACT

Higher amount of okara waste produced from soy bean curd manufacturing is becoming global concern due to big disposal and environment problem. Utilization of okara can be very beneficial due to their high nutritive value as study stated that okara have potential to exert biological activities such as antimicrobial and antioxidant. This approach are milestone steps in reducing okara waste in directly become a big potential to use as source of natural antibiotic. The increasing dependency on antibiotic resulted in emerging of bacteria resistant is becoming a global concern. There is urgent need for innovation, for producing new natural resource antibiotic to prevent or lessen the antibiotic dependency. From previous studies, okara contains mostly crude fiber composed of cellulose, hemi cellulose, and lignin, about 25% protein, 10% lipid and other nutrients. Due to their its functional ingredient composition and health-promoting attributes such as therapeutic activity proved by previous researchers, this research aim is to isolate purify peptides from chosen byproduct waste which is okara; a soybean residue that contain its own nutritive value using enzymatic hydrolysis. The research also includes to determine antimicrobial activity and antioxidant activity of the isolated peptide bacteria using reverse-phase high performance liquid chromatography (HPLC) and Fourier-transform infrared (FTIR) were crucial strategic approaches. Based on the results, it was found that okara contain nitrogen represent about 69.43 % of protein. While HPLC found four unknown compounds in each trial that have same functional group tested by FTIR. Functional group of alkene, alkyne, alkane, alcohol was found in all four of the compounds (e.g. aspartame, glutamate, asparagine, serine) that have similar bands based on standard group band for after HPLC analysis.

TABLE OF CONTENT

	Page
AUTHOR'S DECLARATION	i
PLAGIARISM FORM	ii
SUPERVISOR'S CERTIFICATION	iii
COORDINATOR'S CERTIFICATION	iv
ACKNOWLEDGEMENT	v
ABSTRACT	vi
TABLE OF CONTENT	vii
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER ONE: INTRODUCTION	
1.1 Background of Study	1
1.2 Objectives	4
1.3 Problem Statement	4
1.4 Scope Research	5
CHAPTER TWO: LITERATURE REVIEW	
2.1 Okara: Antimicrobial Peptides Sources	6
2.1.1 Other Bioactive Peptides Source From By-Product Waste	8
2.2 Global Use of Antibiotic	10
2.2.1 Factor Bacteria Getting More Resistant	12
2.3 Antimicrobial Peptides	15
2.3.1 Introduction of Antimicrobial Peptides	15
2.3.2 Structures of Antimicrobial Peptides	16
2.3.3 Mechanism of Interactions	18
2.4 Potential/Application of Antimicrobial Peptides	20
2.4.1 Anticancer	20

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Okara, also known as biji (Korean) or douzha (Chinese), is a food processing by-product derived from soybeans (*Glycine max*) and it is a soybean residue after soymilk production. Large amount of okara are produced especially in current high bean consumption countries such as in Hong Kong, Singapore, Canada and Australia [1]. Moreover, the increasing in soy bean curd manufacturing generated high amount of okara where stated that about 800,000 tons generated in Japan, 310,000 tons in Korea and 2,800,000 tons in China [2]. However, despite large amount of okara generated, they will be discarded due to their high moisture content that lead to spoilage. This show large amount of okara generated can lead to higher amount waste where it can become big disposal and environment problem. Study stated that in Japan most is burnt as waste (Ohno et al., 1993), and in Hong Kong it is dumped in landfills. Small amount of okara has been used as animal feed but it is quite restricted due to their conditions that going stale rapidly, high cost of drying, and low digestibility [3].

There are several studies that show okara functional composition and health promoting characteristics. Some stated that okara contained high nutritive value that might be useful bioactive products. Utilization of okara can be very beneficial because okara contains about 50% fiber, 25% protein, 10% lipid, and other nutrients including isoflavones, lignans, phytosterols, etc [3]. According to Jiménez-Escrig, A (2008), the high protein content of about 30% make it okara as a potential low cost protein. In order to utilize high amount of protein in okara waste, it can be done by protein hydrolysate extraction into any useful product. This approach can help in increasing the utilizing value of okara while decreasing the amount of okara waste that clearly need high cost of